



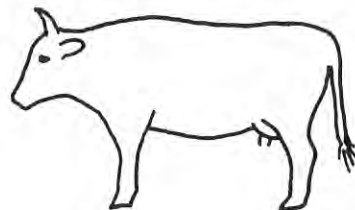
CHAPTER THREE -- NEOLITHIC SPREAD IN EUROPE

The major thrust of the Neolithic entry into the main body of Europe can now be described. Four simultaneous flanking movements of other language groups have already been dealt with: Afro-Asian sweeping across North Africa and into Iberia, Caucasian into the southeastern corner, Altaic throughout the Pontic Steppes, and Aegean along the southern and western coasts of Europe. A fifth flanking movement of Uralics in the north does not get underway until after the Indo-European entry, so its full description is postponed to the end of this chapter.

The overwhelming source of Neolithic farming in Europe is clearly the initial wave of immigrants from Anatolia who first entered the Balkan Peninsula about 7100 B.C. Their identification as Indo-European speakers has already been discussed. Within a century of this entry the first-occupied lands would have been filled to carrying capacity with settlers, and further immigration was quickly phased out. This is the same pattern as with all frontier advances. It is mentioned here only to remind the reader that there was no need for the existence of a great population reservoir in Anatolia to feed into Europe. The initial wave of immigrant farmers is sufficient, and is all that could have entered anyway.

Balkans

Expanding overland at a regular rate the Indo-European farmers would have fanned out uniformly over the southern Balkans. To the north they reached the deep-soil region in northern Bulgaria at 6830 B.C., where they met the Altaic sheep herders who arrived there at about the same time from the opposite direction. Details of this encounter are given in the preceding chapter. The immediate significance is that the entire Pontic Steppe region was then closed to entry by any other ethnic group. The boundary of deep soils and grasslands, along with its inhabitants, forms a right flank bordering the original Indo-European speech area on this continent.



To the west and south the farmers spread over and occupied the major parts of modern Greece, reaching its southern tip at 6500 B.C. Differentiation of the Greek language must have had its ultimate beginning at this time. There is no subsequent event that affords anywhere near this degree of population replacement.

Further expansion in the Balkans would then begin to encounter factors of winter cold and shortened daylight hours, as described in the Rules of Movement. These would seriously affect the intruding farmers in the form of personnel losses from the new climatic factors, local carnivores, and the Mesolithic natives, among other things. The influence of these penalties may be noted on the map of progress along the major routes where dates are given at each 200-km interval (Fig. 10). This becomes even more evident on the map where the advance of the Neolithic frontier is shown in 500-year intervals (Fig. 11).

The advancing wave of farmers would first encounter the Hungarian Plain, roughly the eastern half of modern Hungary, at 6400 B.C. The deep soils here cannot be plowed except for some

choice locations mainly along the rivers. The Neolithic wave became divided into two fronts that passed around each side of this area. Natives of the Hungarian Plain would now have the opportunity to adopt domestic animals, among other things, from their new neighbors. At this time cattle were included among these animals; they apparently were domesticated in the southern

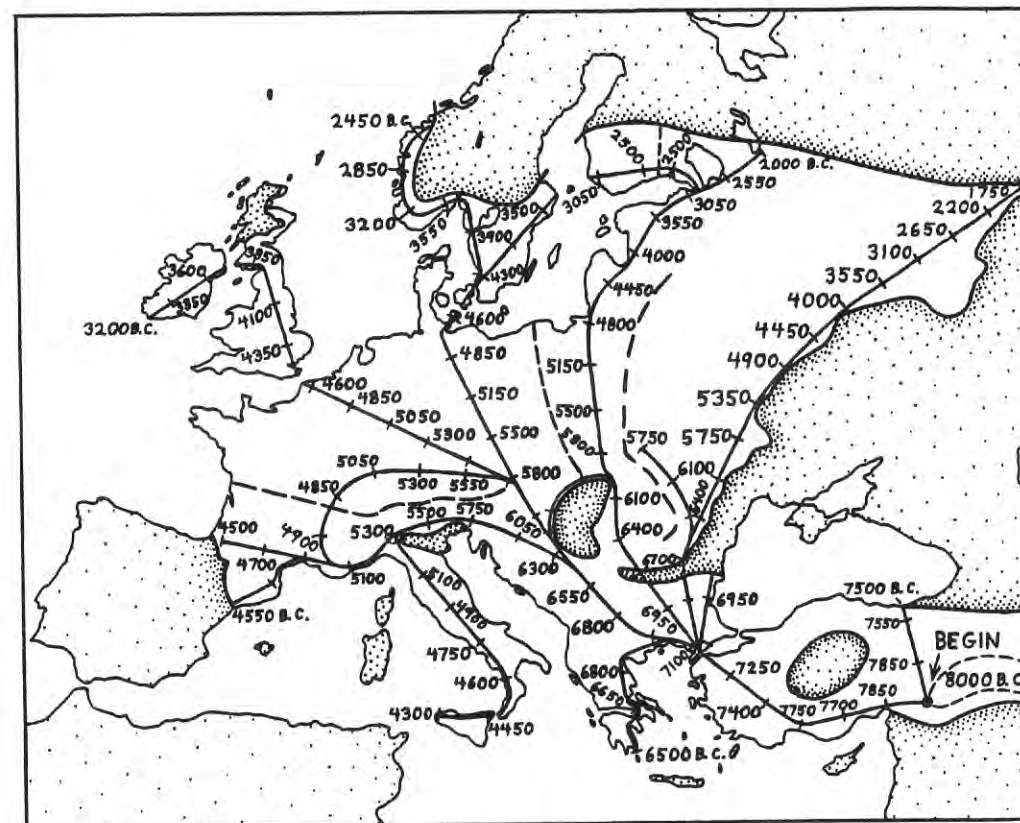


Fig. 10. Neolithic expansion from Anatolia. Heavy lines trace the main routes of Indo-European spread through Asia Minor and over the central part of Europe. Dates are given at each 200-km unit of progress. Indo-European territory, along with that of the Uralic farmers, is left blank; all other speech areas are stippled. Heavy dashed lines show linguistic divisions where incoming peoples were partially separated by natural barriers.

Balkans just a century or so previously (Wenke 1980). Cattle would have gained rapid popularity because they could be used to pull plows, as well as provide meat, milk, and tough hides.

Cattle are well adapted to the European forest zone, and wild forms lived there as part of the natural fauna. Sheep, on the other hand, are not well adapted to forest conditions and had no wild representatives in this area. Farmers can continue keeping sheep in Europe by clearing pasturage and otherwise caring for and protecting them. Pastoralists would often find cattle to be the more useful animal to keep under domestication here. The only advantage of sheep is to use their hair and skins for clothing. It would be automatic for the Hungarian natives to adopt the pastoral aspect of the Neolithic economy, with an emphasis on cattle, along with pottery and whatever else may have seemed useful. They would have taken up little or no farming, and no doubt put less emphasis on permanent dwellings and large amounts of personal property.

As cattle herders these eastern Hungarian natives would then spread out automatically into all available areas that were not already blocked by the advancing farmers. Their rate of advance would be twice that of farmers, just as with the sheep herders of the Eurasian grasslands. By 5800 B.C. the farming frontier would have passed completely around the Hungarian Plain with the two arms of this advance meeting on its northern side. This then cut off the inhabitants of the plain from further contact with their ethnic relatives who had spread out from there to the north and north-east. These cattle herders on the outside, expanding faster than the farmers, would continually outdistance them and come to occupy ever larger territories. The detailed history (with maps) of this advance of herders out of the Hungarian Plain is given in a later section.

The domestication of cattle had been so recent in the Balkans that it probably would not have spread far when the Hungarian natives picked up the practice. Cattle raising should have reached the deep soils of eastern Romania at a similar time. Here they would be adopted by the local pastoralists where they

largely replaced sheep in this economy. This new domesticate would then spread eastward over the Eurasian grasslands. In areas of taller grass, cattle would predominate; in areas of less rainfall and shorter grass, sheep would continue to be the major domestic animal.

A two-part wave of cattle domestication then automatically spread eastward out of the Balkan area. South of the forest zone, cattle were largely substituted for sheep by the existing pastoralists, in place. Within the forest zone, cattle were introduced as the major domestic animal by the influx of the first pastoralists out of Hungary. It may be assumed that cattle replacement in the steppes progressed at about the same rate as the new pastoralists advanced in the forests. Evidently neither got far enough ahead of the other to cross the forest line and make a major ethnic intrusion into the other's area.

Continuing to follow the full Neolithic advance we may note that the meeting point north of the Hungarian Plain represents a 600-year separation of these two waves of farmers. This is not enough time for their speech to become separate languages, but a strong dialect contrast would probably exist by that time. As people advance at known rates from both sides, this meeting point would be extended into a meeting line that can be plotted with some accuracy. It runs to the north-west, curves gradually toward the north because those on the west move faster, and reaches the Baltic about 100 km west of the mouth of the Vistula (Fig. 10).

The continuity of the spreading dialect mesh of Indo-European was broken by this line, especially to the north. It would not have been a major linguistic barrier initially, but as speech innovations emerged on each side some might cross and others might not, and it would have strengthened over time. The continuity from one side of this line to the other would still exist through contacts around the southern side of the Hungarian Plain. This would tend to limit the amount of divergence between the two sides in the north. From its location and early occurrence, this may be taken as the dividing line between the

original Balto-Slavic on the east and Celtic on the west.

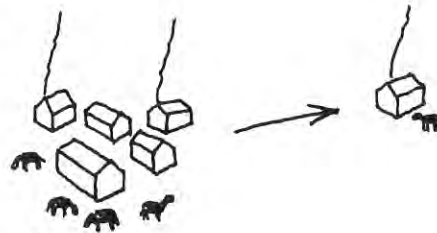
Eastern Europe

The spread of Neolithic farming in eastern Europe involves the entire area between the Celtic meeting line on the west and the Altaic pastoralists on the southeastern border. Within this area of expansion there are two crosscutting divisions--earlier and later phases, and separate paths of advance. The two are described here in that order.

The early phase is that of the Indo-European farmers who can be followed across the entire eastern front, disregarding the separate paths. At their beginning these eastern farmers crossed from Bulgaria to Romania over a band of steppe land along the lower Danube, most of which could not be farmed by simple techniques. It was a narrow strip that was just then being infiltrated by the first Altaic sheep herders, and should have been passed over with little difficulty or delay.

Farther to the north the farmers' advance rate gradually slows down with increasing penalties from colder winters with shorter days. This eventually results in a halt of the ethnic advance well within Russia, and a transfer of the full range of Neolithic technology to the local residents.

Normally, if the native Mesolithic population begins to adopt farming practices, the oncoming wave of established farmers will roll over and incorporate them before they can substantially increase in numbers. At some point the rate of agricultural advance may become so slow that the native inhabitants are able to increase in numbers enough to hold their ground. When the natives are pastoralists instead of hunters, as in this case, the farmer's population advantage is only four to one, instead of ten to one. It can also be assumed that pastoralists will find less



difficulty than would hunters in accepting the full Neolithic way of life. They would need just two full generations of unimpeded (doubling) population increase, with the new technology, in order to match numbers with the incoming people.

Roughly speaking, a slowdown to 450 years per 200 km can be used to mark this transfer of Neolithic technology to the local pastoralists. After this it would be just the technology that spread, not the people, so there would be no further ethnic moves while the Neolithic frontier itself continues to advance. It is assumed here that the advance of Neolithic technology within a resident population would continue at the same rate as it would if it had continued to overrun the natives.

The 450-year transfer rule generates an arc passing through the middle of Latvia and roughly enclosing Belorussia (White Russia). Various parts of this line are reached between 5000 and 4000 B.C. This is reasonably close to the line that is known to have enclosed the early distribution of Baltic dialects, leaving the Uralic language family beyond it to the north and east. This marks the halt of the Indo-European language distribution for over 4000 years. Actually the transfer of farming from Indo-Europeans to Uralics must have taken place on the Lithuanian border, some 100 km to the south of where the above rule would put it. Most likely a denser population of cattle herders near the Baltic coast allowed for a faster matching of numbers with the intruding farmers, thus causing the transfer to happen somewhat earlier along this part of the arc.

Beyond the Indo-European stopping line Neolithic farming technology should continue to spread most likely at its standard rates, becoming still slower in some places. Here it spread among Uralic-speaking herdsmen who had moved out from the Hungarian Plain somewhat earlier. With the farming advance continuing so slowly, it would be adopted by adjacent populations without any significant movements of people on this frontier. This farming frontier continued to advance until it reached the line of the 120-day growing season. Beyond that, pastoralism continued to be the basic economy--one that had switched from

cattle to reindeer in this area.

The advance of Neolithic farming may now be followed along the two major paths in eastern Europe. As the original farmers spread north through Romania there would be a noticeable delay in the colder central part of the country. The crest of the eastern Carpathians can be used to mark this division, as it also served somewhat as a barrier of its own. The western and eastern arms of this advance meet to the north after a separation of 600 years. This separation was probably less than total, so it is not clear how strong a linguistic dividing line was generated beyond here. In any case, this meeting line progresses almost exactly along the recent Polish-Russian division, and then turns automatically to the north-east to continue nearly along the Lithuanian and Latvian borders against Russian. This coincidence is so close as to suggest that it resurfaced when more recent languages spread over the area. (See dashed line in Fig. 10.)

The earlier spread of Uralic pastoralists is described in the next section, but one aspect of it must be anticipated here. They begin in Hungary, and appear automatically to have divided themselves into three major paths as they spread north and east over much of eastern Europe. The dividing line between their left path (Finnics) and their center path (Samoyeds) largely follows the meeting line just described (Fig. 12). This old Uralic division began 200 km to the west of the Polish-Russian line, but it joins that line in northern Poland and they run together to the end of the Indo-European farmer limit. A substratum of Uralic contrasts can be added to the Indo-European contrasts that are here indicated on each side of this line. This comes to mark the division between what might be called Coastal and Interior Baltic (terms invented here), and in recent times is the dividing line between Baltic and Slavic.

The left path of Neolithic advance in eastern Europe runs generally northward between the Baltic coast and this persistent ethnic dividing line paralleling that coast, some 200 km inland. Farming practices transfer to Uralic natives at the Latvian border and continue along this path to the north and north-east.

Farming then curves eastward around the head of the Gulf of Finland and finally moves into Finland itself, crossing the modern border at 2500 B.C. A short distance west of here the advance would be stopped, at about 2300 B.C., when it meets a similar advance of local Neolithic coming from the opposite direction--out of Sweden. (See Fig. 10 for the dashed line paralleling the Baltic coast, and Fig. 12 for the Indo-European stopping line.)

Finland should not show any ethnic break at this meeting line between eastern and western influences. On both sides it was native Finnic peoples who were adopting the full Neolithic practices on their own territory. There should, however, be some kind of a technological contrast here. The two paths that met in southern Finland carried technologies that last parted company in 6500 B.C. in the Balkans. Over 4000 years of separate development, even on the conservative frontier zone all the way, should have led to recognizable differences in art and style.

Further Neolithic advance to the north would end roughly along the line of the 120-day growing season. That would include about one-third of modern Finland. The rest of the country would stay in the hands of reindeer pastoralists for a long time.

The remainder of the Neolithic advance in eastern Europe, its right path, would come out of eastern Romania and run generally to the north-east into most of Russia. This is bounded on the west by the Baltic path of Neolithic immigration, and on the east by the Eurasian grasslands where cattle were just being adopted by the resident Altaic sheep herders. This is a broad front, almost 500 km wide near its beginning and increasing to over 800 km at its widest part.

The post-Romanian part of this path consists of the western Ukraine (the forested part), and then passes over the Pripet marshes to encompass Belorussia. These marshes probably did not slow the Neolithic advance, but were enough of a linguistic barrier to later form part of the dividing line between Slavic to the south and Baltic to the north.

The farming front at first should have advanced directly

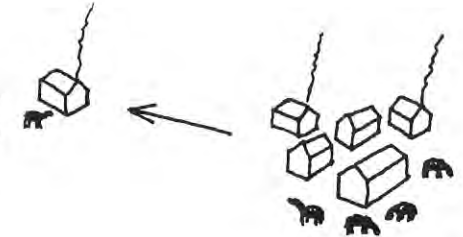
northward through Romania and fanned out equally to the north-west and north-east within the Ukraine. After that it automatically turned more to the north-east as its western part advanced more rapidly, and it was pressed in by the even faster advance of farmers along the Baltic path. The line of technology transfer was then reached along the northeastern boundary of modern Belorussia. (See Figs. 10 and 12.)

The continuing Neolithic advance was then of technology only, and passed through the Uralic pastoralists who were native to the area. This should be archeologically testable where early farming passes through the area, and it should be marked by a style line where ethnic identity changed from intruders to residents. From here on, the Uralic substratum is presumed to be divided into two paths of about equal width. Closer to the Baltic is the central Uralic group, here equated with the ancestral Samoyeds. Adjacent to the Pontic Steppes is the right branch of the Uralics, presumed to be the original Vogul/Ostiaks (Ugric speakers). Both of these pastoral groups would have adopted Neolithic farming techniques and passed them on even deeper inland, with no expectation of significant internal population movement. Increasingly severe winter conditions along these paths would suggest that local population densities did not rise as much as in the milder climates to the west. There is no indication that the internal dividing line between these two Uralic language groups ever surfaced here in later populations.

The frontier of the full Neolithic economy continued to move eastward and eventually pinched out between the converging lines of the 120-day growing season on the north and the edge of deep soils on the south. These meet on the western slopes of the Ural Mountains, and this point should have been reached about 1750 B.C. Beyond the 120-day season, both north and east, there would be the reindeer-based Uralic pastoralists. To the south, in the deep soils, would be the cattle-based Altaic pastoralists. Reindeer and cattle zones meet at the Urals, and the dividing line between them continues to the east into Asia.

Western Europe

The Neolithic frontier advancement around the western side of the Hungarian Plain constitutes the rest of the Indo-European source for Europe. This advance subdivides into many different routes, of which two can be considered major. These were separated from each other by the Eastern Alps into northern and southern branches. The northern branch leads to the largest area and is described first.



A direct course can be plotted from western Hungary to Denmark, then across the islands into Sweden. From this path people filled in the western, or Celtic, side of the dividing line running from Hungary to the Baltic. The rate of advance generally slows down along this route because of colder winters and shorter days. There is one minor exception at the base of the Danish peninsula where winters are warmer than before or later.

It has been calculated that the Aegean Boat People reached the Danish islands just ahead of the overland farmers. If so, they would provide the means of transportation between these islands and into Sweden. If this calculation is in error we may assume that the local Mesolithic water craft were capable of moving some of these farmers and their livestock.

This northern European path can be followed directly to the coast of eastern Sweden to where it meets the 120-day growing season line at 3050 B.C. A branch of this path would turn off to the north-east and cross the lower end of the Gulf of Bothnia to reach Finland. I am assuming that shipping would continue to be available throughout Sweden, even in the absence of the Sea Shepherds, because of the area's extensive network of waterways and offshore islands. There should have been no delay gaining transportation to the Aaland Islands and on to southwestern Finland. By counting only land distances in this last 200-km

unit the Neolithic people and their economy should have been able to enter Finland over a long stretch of its southern and western coasts. Shipping contact between this coastal strip and Sweden would have been maintained thereafter. Swedish speech along this strip thus may date back to 3050 B.C.

The rate of Neolithic advance slows dramatically as Finland is entered, and its transfer to native Finnic speakers would be automatic just inland from the coastal strip. In this new manner the economy alone would progress across Finland at the rate of 550 years (the maximum) for the next 200 km. With just a small additional advance, the Neolithic way of life should meet its counterpart entering Finland from the south-east at 2300 B.C. Not surprisingly, the archeological contrast between these two sides of the country has long been noted, while the only linguistic contrast is the one far to the south-west where Swedes and Finns meet (Kivikoski 1967).

The Neolithic advance can be followed up the interior of Norway with interesting results. At the latitude of Oslo the 120-day line is met, at 3500 B.C., and farming necessarily stops. Cattle herding and other traits would then transfer to the native Mesolithic Scandinavians of the interior. This pastoralism then should have advanced through and over other Mesolithic hunters at the rate of 75 years, plus penalties, per 200 km. After an advance of about 270 km they would meet the southward moving Uralic (Lappish) reindeer herders in 3130 B.C. This encounter is calculated to have occurred on Lake Femund, which in recent years just happens to mark the southernmost extent of the Lapps. The remainder of the meeting line between Lapps and Scandinavian herdsman, and the full boundary of the latter may be seen in Fig. 13.

The mountainous interior of the southern part of the Scandinavian Peninsula thus contained a presently unknown ethnic group. These were local Mesolithic Caucasoids (racially), unrelated to either the Indo-European farmers intruding from the south nor to the Finnic-speaking Lapps from the north. I shall call them "Nordics."

Their approximate area of 145,000 sq km could have supported about 36,000 cattle herders at 0.25 per sq km. Their relatives in the rest of lower Scandinavia were early overrun and absorbed by the Neolithic farmers. This part of lower Scandinavia amounted to some 186,000 sq km. With a 2% incorporation of hunters into the farmer's population in this area, this amounts to 4000 people. Native Scandinavians thus totaled about 40,000 people, as compared with 186,000 Indo-European farmers (assuming 1.0 per sq km initially). When they later all mixed, these Nordics would constitute 17.6% of the total Scandinavian population, not counting the Lapps. This is by far the largest increment of native incorporation into the Indo-European speaking population for any major area. This could go a long way toward explaining the 30% non-Indo-European vocabulary that Lockwood (1969) says is found in basic Germanic.

For all practical purposes the narrow base of the Danish peninsula may be taken as the division between the Germanic of the northlands and the Celtic speech of the continent. That Germanic initially differentiated in just such a compact area is linguistically indicated by the uniformity of its sound shifts (Lehman 1970:2).

Indo-European farmers moving more nearly westward may now be followed along the path leading to the British Isles. Their progress would be more rapid than it was to the north--250 years for each 200 km for most of the way. They should reach the Straits of Dover at 4500 B.C., and cross into England with the aid of the Aegean Boat People who got there 600 years earlier. At 3700 B.C. they again make use of these Sea Shepherds to get into Ireland. At 3200 B.C. their frontier reaches land's end at the southwestern corner of Ireland.

Farming progress necessarily came to a halt after only a minor penetration of Scotland. The Moor land is good pasturage, especially for sheep, but most of it cannot be farmed even today. Most likely the Sea Shepherds settled this area and have biologically survived to this day. Their original language is now lost, although Pictish is probably its last survival, which

died out by 1000 A.D.

Some form of sea navigation was most likely a local Mesolithic development in western Scotland, a tradition which later merged with its Aegean counterpart. Such a cluster of habitable islands just offshore should have stimulated the natives to devise shipping wherever they occur. Just as with the Danish island cluster, local boats might have been able to transport the farmers even if the Aegean Boat People had not been there--but we may never know for sure.

The Indo-European progress across Germany and France would be unremarkable, though the Low Countries may have been settled only sparsely at this time. It should have gone roughly according to the schedule given here. The spread to the south through France would halt along an east-west line about even with the southern border of Switzerland. This line is where they would meet the southern branch of the western Indo-European farmers--those who passed to the south of the Alps. This meeting first occurs just to the south-west of Geneva at 4800 B.C., and extends due west to the Atlantic where it finally closes up at 4350 B.C.

The area allocated here to the proto-Celtic speech community is very large, especially in its breadth from central Poland all the way to Ireland. Throughout most of this area there were no dividing lines at natural obstacles that might have created separations. The only constrictions are those which separate Ireland from Great Britain, and it from the continent. The presence of considerable coastal navigation, where the Boat People presumably merged with the local farmers, would have reduced the impact of these constrictions. There were few major enclaves within the area to set one part off in contrast to another, as with Scandinavia. The only obvious enclave was that of the Sea Shepherds in Scotland. The region in and around the Low Countries, with its unusual place names, remains an enigma.

I see no good reason why this entire Celtic area should not have maintained a high degree of linguistic unity for several millenia. Given the geographical circumstances this should have

been no problem. Still, it is contrary to the usual view to say that Britain and Ireland have been of Celtic speech since the earliest Neolithic. Historical evidence of certain Celtic movements into Britain does not mean that the original inhabitants were not also Celtic. The archeological record was formerly interpreted as showing repeated mass immigrations into Britain, but these are now discounted by many authorities.

If evidence could be produced for a population replacement, or even a conquest by a higher civilization prior to the Roman Empire, then we would have to allow for at least the possibility of a pre-Celtic Indo-European speech in Britain. It might even turn out that the Aegean sheep herders had managed a significant and lasting area of occupation elsewhere than in Scotland. But on present evidence neither of these seems likely.

The southern branch of the western flow of Indo-European farmers passed from Yugoslavia into Italy with little delay. They would be forced to by-pass the deep soils and marshes of the Po River valley before progressing down the length of Italy and into Sicily. The sea crossing through Elba to Corsica and Sardinia was probably accomplished at a slightly later date.

The other route of advance of this southern branch continued along the Mediterranean coast and spread over southern France with no appreciable delay. These farmers expanded northward and would meet the proto-Celtics at the latitude of southern Switzerland. The term Ligurian was applied in early historic times to the language community that stretched across northern Italy and southern France. Its continuity would be natural at the time of first settlement by Neolithic farmers. A pronounced constriction because of the mountains on the present French-Italian border should have led to an early differentiation into eastern and western parts. Curiously, there is little historical evidence that this happened, and the same term was used for both areas into Roman times.

The division between Ligurian and Celtic stemmed from their split at the eastern Alps in Austria. This separation was 1200 years old when they first encountered one another again in

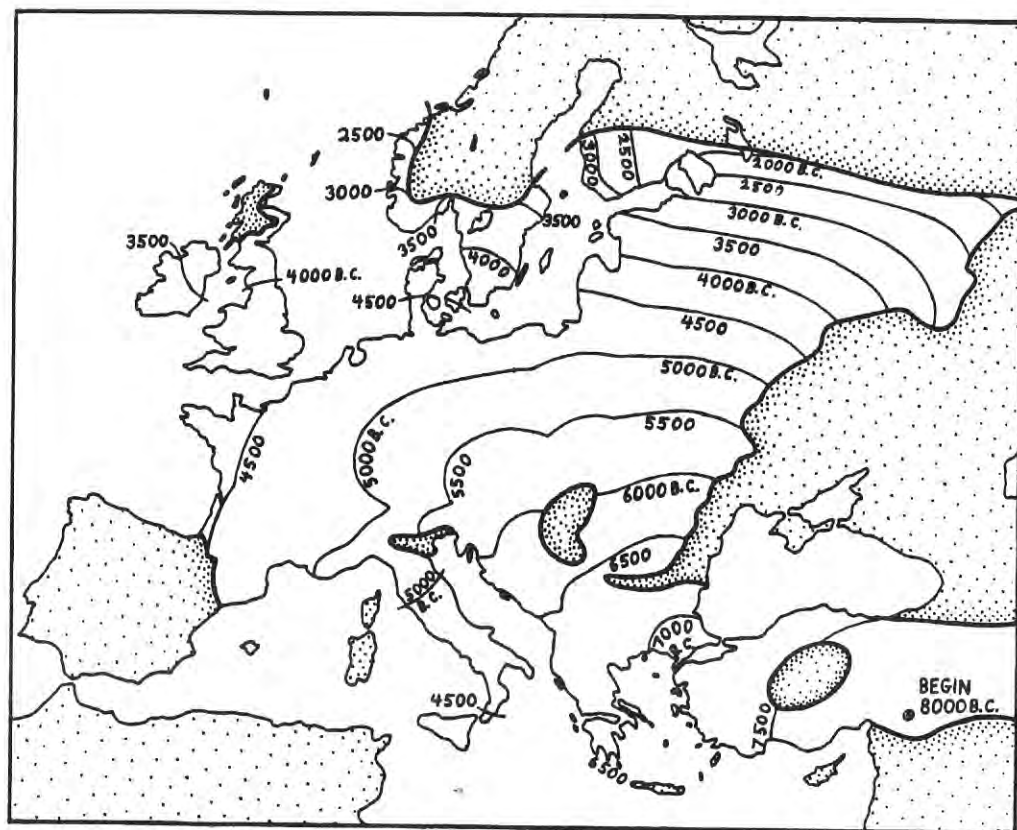


Fig. 11. Rate of Neolithic expansion. The farming frontier in Europe is shown at 500-year intervals from its inception in Anatolia at 8000 B.C. The contours are drawn from data given in Fig. 10 and from many more routes of spread that were also calculated. This map compares favorably with calibrated dates of the earliest farming sites, but this is because the advance rates were chosen partly with this goal in mind. The map omits the Neolithic of the Mediterranean that was spread by the Aegean Boat People only after their initial wave.

France. This is twice as long as the proposed initial separation between Celtic and Baltic, and it should have created a significant linguistic barrier. By the time the two sides reached the Atlantic their separation was 1650 years in the past. The division was known in early historic times and it survived the Latinization of Gaul. It was later reinforced by Germanic influences in northern France that did not extend to the southern part. Today the distinction between French and Provencal is approximately on this line. A sufficiently deep analysis of Provencal should show an ultimately Italic connection long prior to Latinization.

To the south-west the Indo-European farmers crossed the eastern end of the Pyrenees and would have progressed about 200 km into the northeastern corner of Iberia. Here they met the Afro-Asian farmers who had spread over northern Africa and moved up through the rest of Iberia. These Iberians had essentially the same Neolithic economy, although probably without domestic cattle at that time.

Toward the western end of the Pyrenees it was the Afro-Asians who reached the mountains earliest. They crossed over to meet the Indo-Europeans on the French side at 4550 B.C. At this end the transgression was much less, only about 50 km to the north and 100 km inland.

At this point the initial distribution of Indo-European speech throughout Europe is complete. A discussion of this long-lasting, stable condition must await a description of the geographical spread of the Uralic language family.

Uralic Spread

The Uralic language family is unrelated to Indo-European, and makes up a minor part of the European linguistic picture of today. It is of interest in this study partly because of its



present distribution, but also because it included much more of Europe in the past. In addition, a detailed study of the Uralic subdivisions further illustrates some of the geographic principles that are presented here.

Uralic languages today are spoken across much of northern Europe and Asia, and in Hungary. Within the U.S.S.R. the Uralic and Altaic national minorities are now distributed with the former mostly in the forest zone and the latter in the steppes. (See the eastern part of Fig. 1.) According to most authorities the original Uralic homeland was in the Ural Mountain area, hence the name. From this central location these people supposedly spread out in all directions to reach their present distribution, and entered Hungary in 896 A.D.

I find all of this highly improbable for various reasons. A geographically central location is no evidence that this is the original site of a language group. The reason for its spread must be demonstrated--it cannot be assumed to have expanded automatically, and equally, in all directions. The penetration of central Europe in the 9th Century by a northern Asian tribe is possible. But a population replacement, or even a language change, by such a tribe within a well-populated agricultural region like Hungary at that time is clearly impossible. Any such claim should be accompanied by an explanation of the mechanism whereby this change might have been accomplished.

Given these objections the actual Uralic-speaking distributions would allow only one alternative explanation--that the family originated in Hungary and spread out in the opposite direction. This poses no serious problem if the time for this origin and dispersion is put at the earliest Neolithic. If this is true it means that Hungarian (Magyar) is actually the oldest in-place language in all of Europe. To test this idea it must be shown here that the present Uralic distributions can follow automatically from a Hungarian source, and this must be done through the consistent application of logical rules of population movements. It must also be shown that the subdivisions of Uralic are distributed in reasonable conformity with these rules.

The following is a detailed description of events that result automatically in the correct distribution of this family. In a later chapter some additional movements are described that lead to the modern distributions of each of its subdivisions. I can find no other approach that even remotely fits both the known facts and simple consistency.

The Neolithic frontier first reached the Hungarian Plain at 6400 B.C., as noted earlier, according to the schedule used here. The deep soil in this area precluded farming in all but a few choice locations. At least 60,000 sq km would remain in the hands of Mesolithic hunters. With a density of 0.1 per sq km, there should have been about 6000 people here, expectably divided into 12 tribes of 500 each. The most parsimonious arrangement of this number of tribes would be a row of four across the northern border, four more just below these, then a row of three, and finally one at the southern tip (Fig. 12 A). The actual number and arrangement might well have differed from this, but the row of four dialect tribes across the northern edge is the only item of significance here. Just as with other hunters, these dialects should have been mutually intelligible, but with clear distinctions from each other.

From their new neighbors to the south these hunters would adopt cattle herding and many other Neolithic traits, but little or no farming. Within 200 years (almost seven generations) this new economy should have been integrated and spread throughout the area. This is the same amount of time it would take to advance a herding frontier through the plain if it started immediately upon contact with the farmers. This is also the same time delay that was allowed for the adoption and spread of sheep herding among the Boat People throughout the Aegean Sea.

It is assumed here that all the natives of the Hungarian Plain would have seen themselves as something of a related unit in contrast to the inhabitants of the surrounding forested hill country. The innovation of cattle-based pastoralism ought to have spread freely and easily among these tribes with little transgression onto each other's territories. The eventual spread

of this economy out of the plain would begin mainly with an expansion of the edge tribes overrunning their immediate hunting-gathering neighbors.

When this expansion gets underway at 6200 B.C. the farmers will have advanced one-third of the way around each side of the plain. Those cattle herders moving out to the east and west from the central section would soon be overrun by the more numerous farmers with their own cattle. Only those herders who spread out from the row of four tribal areas across the northern edge have unimpeded and unlimited space to expand into. These people would spread out and away from the oncoming farming frontier, and at about twice the rate of speed of these farmers. Eventually the farmers closed in around the northern side of the Hungarian Plain and isolated the original body of cattle herders, but many of their descendants would already have moved out and were able to continue their expansion into new areas. We now have two Neolithic frontiers in eastern Europe--fast-moving pastoralists overrunning hunters, followed by slower moving farmers who are gradually incorporating the pastoralists from behind. (See Fig. 12 for a sequence of seven maps showing this action.)

Of the four original hunting tribal areas on the northern fringe, the ultimate disposition of three of these is the major theme of what follows. As cattle herding developed, and population increased by maybe 2 1/2 times, these four tribes should have begun to subdivide into smaller areas with comparable populations. As each subdivides into two or three social groups within its original hunting territory they would also be sending surplus population outward into new areas. The linguistic differences that separated the original four hunting tribes would be perpetuated in the rapid spread of people from each of them. Linguistically speaking, four distinct dialects from the Hungarian Plain would radiate outward with these expanding populations. One can assume that each of these four groups started out with equal numbers and reproductive potential, and came to occupy comparable tracts of land. These are referred to as groups I through IV, which may be followed along paths of the

same numbers.

A new irregularity must be introduced at this point concerning the directions of spread of the four groups. At first glance it would seem they should spread over a full range from north-west through north-east--at least 50° both west and east of due north. In fact they would spread to the west by no more than 30° from north. This consideration was based initially on examination of subsequent linguistic distributions. If Group I on the left had spread as much as 45° west of north, then its people would have gained access to Denmark. From there they should have had little difficulty crossing into Sweden (using local Mesolithic boats) and spreading over the main part of Scandinavia. These should then be the ancestors of the Lapps who switched from cattle to reindeer herding along the way.

The first problem with this scenario is that Lapps have a Finnic-related language, clearly a part of Group II that can be traced up the east side of the Baltic. A Group I origin for the Lapps would have made their language one of the major branches of Uralic, instead of just a subdivision of Finnic. The second problem relates to the 30% of non-Indo-European vocabulary that is found in the Germanic languages. The only obvious source of this vocabulary is the native population of Scandinavia. If these had been herders out of the Hungarian Plain, then the outside component in Germanic should have been of a Uralic type. Evidently it is not, as this is the first possibility that would have been looked at.

In this reconstruction we are compelled to block the westward spread of these cattle herders at about 30° west of north, and thus have them fail to reach Denmark. The only apparent reason for this would be the density of the Mesolithic hunter population in the western part of Europe where winter survival was easier. Native hunters would take a toll of domestic animals and of the herders themselves. At some level these hunters would be so numerous as to delay, and perhaps even stop, the progress of these pastoralists. Rather than try to develop a new delaying factor for this one case I simply limited

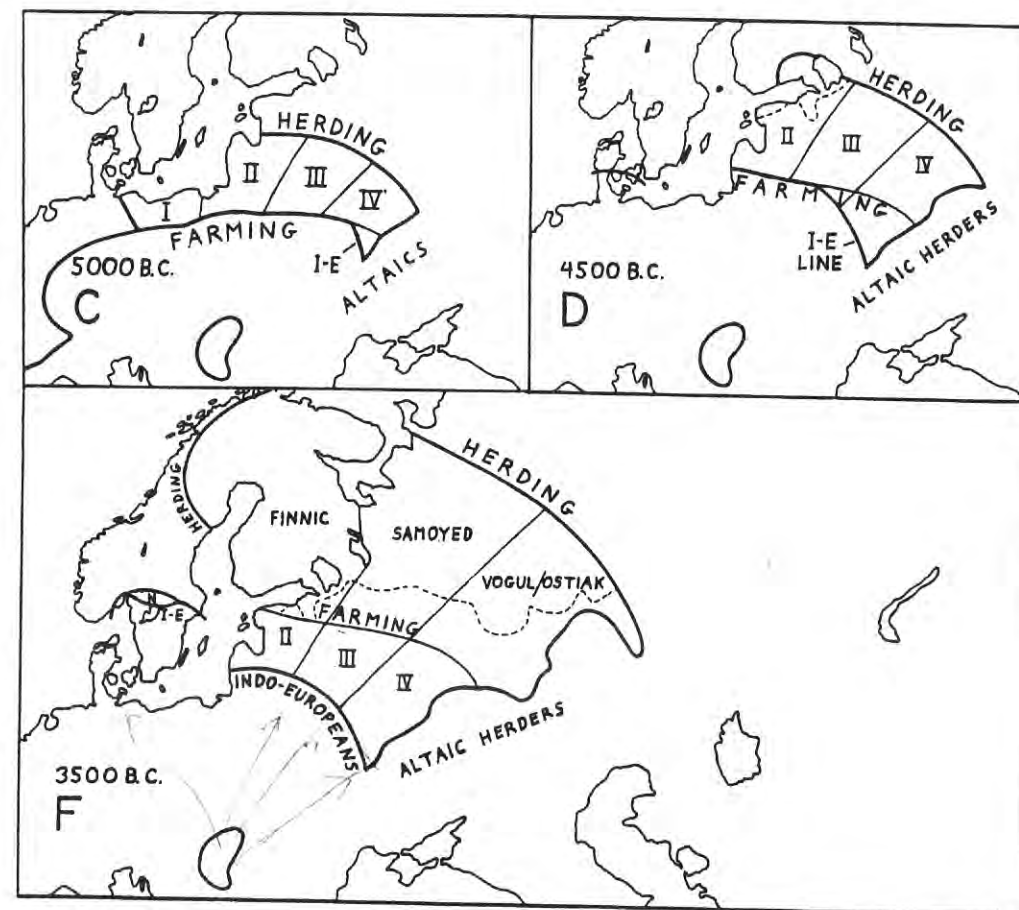
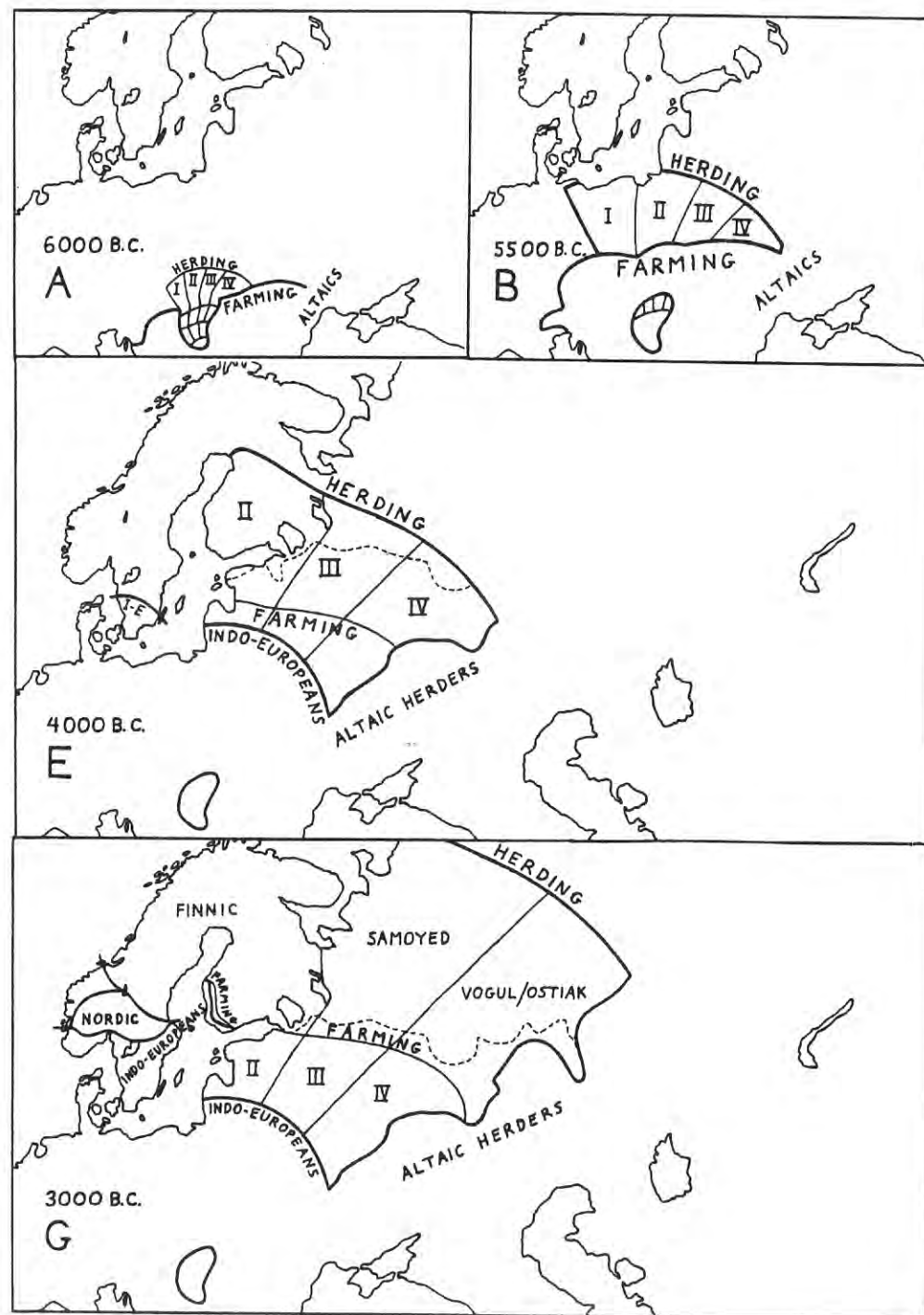


Fig. 12. Uralic expansion. The spread of Uralics is given at 500-year intervals. Cattle herding reaches the Hungarian Plain at 6400 B.C. and the expansion begins at 6200 B.C. Map A shows dialect tribes, the numbered four in the North showing 200 years' worth of expansion. In map B they reach the Baltic, while Indo-European farmers have closed around and isolated their source. The herding frontier advances in C through G, and the farming frontier moves slowly behind. Map E shows a full separation of the Indo-European speech line from the still-advancing farming frontier, well within the Uralic area. Heavy lines mark language families while lighter lines show some subdivisions and economic contrasts. The dashed line marks the reindeer boundary.

the westward spread of cattle herders to the radius at 30° west of north.

Each of these four dialects then would fan out of Hungary over an arc of about 20° by Mercator projection. Group I centers on 20° west of north, Group II starts out due north, Group III centers on 20° east of north, and Group IV has a heading of 40°. Group I would fan out over most of western Poland, reaching the Baltic Sea in less than 500 years. Within the next 700 years they would be ignominiously overrun by farmers and terminated without linguistic issue.

Group II moved due north at first, then automatically curved to the east. This curve results in part from the differential advance rate between themselves and the slower Group III on their right. It may also follow from the pressure of their own members edging to the east to avoid dead-ending along the Baltic coast. Group II continues northeastward and around the Gulf of Finland, presumably crossing at the narrow part (20 km) just west of Leningrad. They should also pass around to the east of Lake Ladoga. This arm would have been nearly pinched off at this lake by Group III. Some of them should have advanced on up the west side of Lake Onega, but Group III would take its east side.

Somewhere along this course it may be assumed that there was a transfer from cattle to reindeer herding. I have put this at the recent boundary between mixed forest and the fully coniferous forest. (This boundary is given in many atlases with minor variations, so I used the one from Goode's World Atlas, 15th edition, simply because it had the fewest irregularities.) Along the path of Group II this event would center on the modern border of Estonia and Russia (Fig. 12 D). After the change to this new major domesticated it is assumed that their population density would go down somewhat, and the area occupied by a 500-person tribe would correspondingly increase. It is also assumed that the density of local hunters would also be declining, so as to permit this. From here on, their rate of advance has been somewhat arbitrarily increased to a basic 60 years per 200 km--the time reduced from the 75 years that was used for them as

cattle herders. The same rules continue to be applied for the delay factors from reduced winter temperature and daylight. Each increment of these two factors adds 20 years (again one-third of the basic rate) to the time required to advance the frontier by 200 km. The maximum application of these penalties is still held to the same four increments for each factor. The slowest rate of progress for this set of conditions now becomes 220 years per 200 km, vs the 275 years for the cattle-based economy.

With this new rate of advance, the herders of Group II, the presumed Finnic branch of Uralics, would have spread over all of modern Karelia and Finland. Their progress would continue around the head of the Gulf of Bothnia and then down the Scandinavian Peninsula. On the shore of this gulf, about 180 km north of Stockholm, they would encounter the Indo-European farmers who had been advancing to the north. Both groups should reach this meeting point sometime between 3200 and 3100 B.C. The exact timing is not very critical here because this is also the stopping line for farmers--the 120-day growing season. The Neolithic farmers with their boats, cattle, and greater numbers should have extended their occupation some distance beyond this meeting, but only along a thin strip of the Baltic coast.

In the interior of Scandinavia the southward progression of Group II Uralics would be stopped at Lake Femund at about 3130 B.C. Here they should have met the local Nordic pastoralists who had adopted cattle herding from the incoming Indo-European farmers. Shortly thereafter, the meeting line would automatically extend almost due west from here to the Norwegian coast. The southern farmers can also be expected to have extended their control of the Atlantic coastal strip substantially to the north.

The area inhabited by Group II Uralics was also being overrun from behind by the advancing Indo-European farmers who had surrounded and then passed beyond the source area. The progress of these farmers would have gradually slowed and finally stopped on the Lithuania-Latvia border at 4400 B.C. Farming then would have automatically transferred to these Finnic speakers who

added it to their economy and passed it on through their fellows as far north as the 120-day growing-season line. This would eventually mark the division between Finnish and Lappish. The distribution of Finnic languages, from Latvia through Lapland, would remain little changed until the advent of deep-soil plowing that entered their area around 700 A.D. Even then, what territory they lost in the south was more than made up by gains in the east. This is described later. The total area occupied by this linguistic unit included an impressive part of Europe, both then and now, but their numbers have never been very great.

The progress of Group III Uralic herders was fairly simple. They expanded out of the Hungarian Plain at 20° east of due north, and gradually curved more to the east because of the advance-rate differential with Group IV on their right. Eventually they progress almost due east, but this is largely a simple consequence of their great-circle route being plotted on a Mercator projection.

Group III Uralics should have adopted reindeer herding at the same line of full coniferous forest--about 400 km east of Leningrad. They soon reached the Arctic coast and progressed along it as far as the Taymyr Peninsula. This automatic distribution coincides almost exactly with the modern Samoyed speech area after some of its European part is subtracted later by other peoples. Their identification with this branch of the Uralic family would appear to be unavoidable.

Group IV Uralics left the Hungarian Plain from its northeastern corner--a seemingly minor fact that proves to have great significance much later. Their progress centered on 40° to the east of due north, and this also follows a great-circle route that eventually heads due east into central Siberia. Their path was bounded by Group III on their left, and by the forest edge on their right. Here they should have been almost keeping pace with the spread of cattle keeping that was being adopted by the previous sheep-herding Altaics in the Steppes. Deep into Russia most of them would be expected to adopt reindeer herding upon entering the purely coniferous forest. The automatic

distribution of peoples along this path, with appropriate later subtractions nearer their source, coincides almost exactly with the Vogul/Ostiak branch of the Uralic family. This linguistic identification is assumed to be the case.

Groups III and IV were being overrun from behind by Neolithic farmers just as Group II was. These Indo-European farmers were able to advance over what is now Belorussia, then bogged down and transferred their farming to these Uralic cattle herders. With all three Uralic groups, Finnic, Samoyed, and Vogul/Ostiak, the farming technology moves through them at the rate of 450 or more years per 200 km. While this would increase their population it would likely be too little and too slow to cause any significant movements of people. The linguistic boundaries should have stayed constant after this farming transfer.

Most linguistic classifications of the Uralic family first separate Samoyed from the rest, and then subdivide these into Finnic and Ugric (Magyar plus Vogul/Ostiak). This is not in accord with the three co-equal groups described above. However, other detailed analyses of Uralic do give the three groups as used here. Hajdu (1976) shows that these three are almost exactly equally distinct from one another.

The lengthy description given above is of regular and geographically predictable events. These would have led automatically to a distribution along the three major migration paths directly into the areas that the three Uralic branches occupy in more recent times. This has involved no unexplained migrations or expansions of a "historical" nature to put these people in their correct locations. This appears to be much more than mere coincidence. Finer dating of the pertinent archeological remains should show the direction of movements.

It remains to be shown why it is Vogul/Ostiak, and not one of the other two, that should be the most closely related to the recent language of Hungary--Magyar. There is also a major shift to the east by many Finnic speakers that must be accounted for. Both of these are neatly explained in a later chapter as

automatic consequences of a technological change a few thousand years after this initial dispersal.

Language Map

After the Neolithic economy spread to its natural limits in all possible directions, the linguistic map of Europe achieved a long-lasting stable condition. For the southeastern corner this time of stability dates back as far as 6500 B.C. For most of Europe stability was reached by around 4000 B.C., while in Ireland and Scandinavia a few minor ethnic movements continued through the next millennium. Fig. 13 shows the distribution of languages that automatically results from the processes that have been described up to this point.

From this time of settlement, all the way up 500 B.C., there is no indication of any significant factors that would have made changes in the linguistic geography of Europe. For most of the continent this first period of stability lasted 4000 years; for some parts it was over 6000 years. This is much longer than all the time that has passed since then. The remaining linguistic movements and differentiations occurred mostly in just a 2000 year period from 500 B.C. to 1500 A.D. These consisted of four major events that grade into one another, and which can be separately mapped only with some arbitrariness. The only other period of relative stability is the last 500 years of European history.

The map of Europe during this first stabilization shows a number of very different languages that largely surround the continuous dialect mesh of Indo-European intruders. In the southwestern corner Iberia is occupied by presumed speakers of the Afro-Asian family that also stretches across northern Africa back to their source area in the Near East. In a smaller northwestern corner is the Pictish speech of Scotland that may

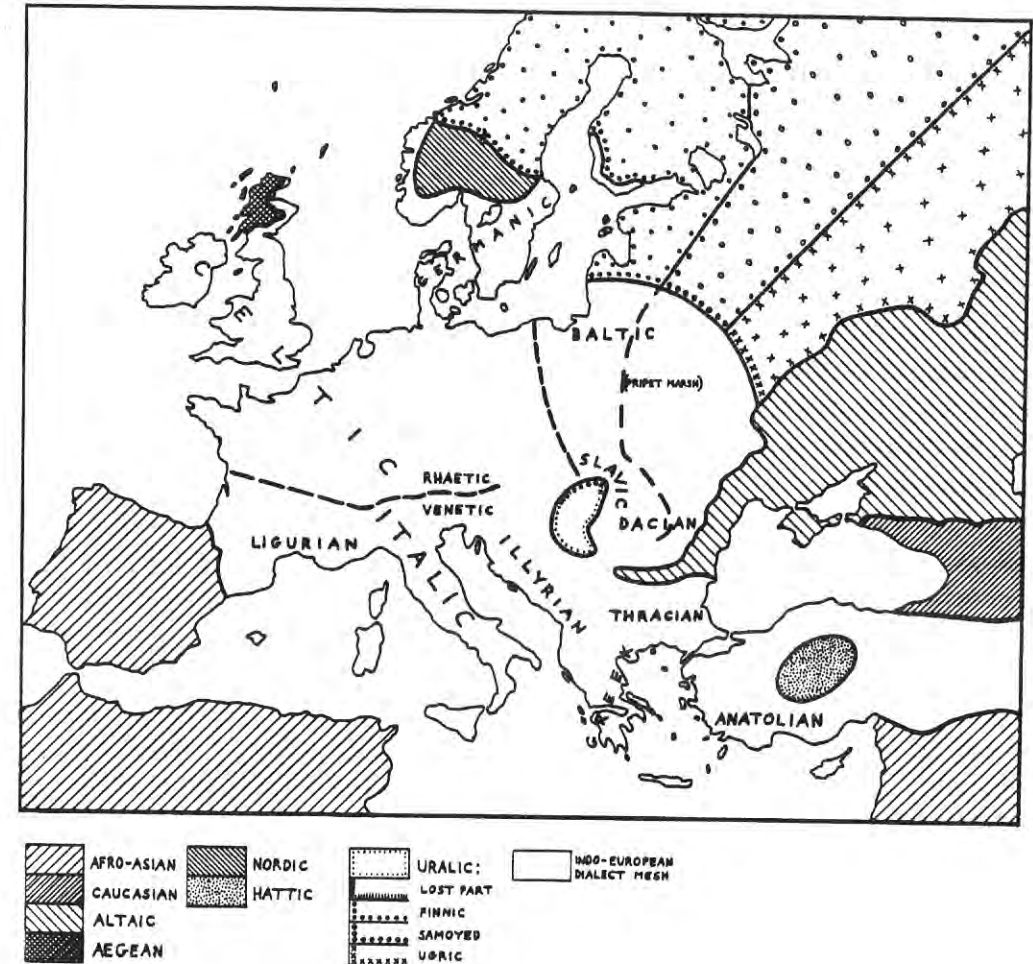


Fig. 13. Language map at first stabilization. Shortly after 3000 B.C. Europe had seven language families with the distributions shown here. In the south-east this stability was reached as much as 4000 years earlier. Areas of developing Indo-European dialects are indicated, along with some linguistic barriers. Aegean languages might have survived in other places, especially in Italy and the Ligurian area. Mesolithic languages should also have survived in the Low Countries, and in the Po Valley.

ultimately derive from the Mesolithic Boat People of the Aegean. To the north we find part of the wide-spread Uralic language family that continues through most of Finland, Estonia, Latvia, and Great Russia, as well as their surrounded source land in the Hungarian Plain. The Altaics stretch from eastern Romania, through the Ukraine, and on into central Asia. Caucasian occupies northeastern Anatolia and the Caucasus Mountain area. Brief Mesolithic survivals no doubt occurred in many places, the Scandinavian cattle herders being the most conspicuous of these, and the only one shown in Europe. The Hattics are a major survival in Asia Minor. Others would have lasted for some time in such places as the Po River valley and the Low Countries, but they were of no ultimate significance and eventually disappeared. The Aegean Sea Shepherds left settlements along much of the Mediterranean and Atlantic coast, but these too were rapidly absorbed when the full Neolithic economy arrived in each area from the landward side.

The central core of Europe is occupied by Indo-European speakers at this time. Their boundaries with all the other languages mentioned here are sharp and total. Only through Anatolia, and from there on into Iran and India, do they have linguistic continuity outside of Europe. The otherwise simple picture of a dialect mesh of gradual differentiation is broken in only a few distinct places, and none of these is fully bounded.

A major dividing line developed when the immigrant farmers were separated by the full length of the Alps and Eastern Alps, and this line was then extended to the Atlantic coast from their meeting point beyond that barrier. This separated Celtic from the Ligurian-Italic speech areas, but their linguistic continuity was maintained around the eastern end of the mountains. A similar separation occurred when the farmers passed around the Hungarian Plain, met again on its northern side, and continued this dividing line to the Baltic shore. This was the initial basis for a division between Celtic on the west, and Balto-Slavic on the east. A mountain and temperature barrier in the eastern Carpathians led to yet another separation whose repercussions

become evident only later. The Pripet Marshes provide a partial barrier between Baltic and Slavic. Germanic tends to pinch off from Celtic at the constriction of southern Denmark. Reduced communication tending to separate both Ireland and Great Britain ought to have caused some divisions, but apparently these were not significant. Indo-Iranian is not distinguished here from Anatolian because this separation nowhere affects the reconstruction of European language distributions.

The Indo-European dialect mesh in Europe at this time would show some divisive tendencies, but none need be called separate languages. Those at the prominent meeting lines maintained continuity back through their places of initial separation, no matter how distinct the linguistic barrier at the far end might have become. Constrictions should still have maintained continuity even if the changes were rather abrupt through the corridors. Sheer distance, combined with minor geographical barriers, would have tended to emphasize regional contrasts. The map of Europe at this time can be labeled with many Indo-European "languages," but it must be noted that these are probably only dialects in a complex network, and none would necessarily be truly distinct or bounded from any other. Linguistic innovations that appeared at any point within the mesh would still tend to spread eventually over the entire system. In other words, this dialect mesh continued to evolve, or change over time, as a single unit, regardless of its slowly increasing internal diversity.

These Indo-European dialects would not separate into independently evolving lines until something happened to create separate groups that were fully bounded from each other.

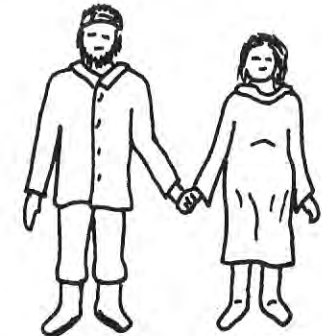


CHAPTER FOUR -- RACIAL PROPORTIONS

Population Mixing

It is assumed here that the introduction of Neolithic farming and herding practices into Europe was accomplished primarily by an incoming wave of immigrants from the Near East.

To assume otherwise would require postulating and supporting some unique circumstance for this area of the world. It is also assumed that a small proportion of the native peoples was genetically incorporated into this intruding population at a regular and



cumulative rate. This section summarizes my efforts to quantify this incorporation on a geographical basis.

There are two basic aspects to this population mixing. One is the introduction of Anatolian genes into the European pool by the farmers. (Primitively, the genetic barrier between the Balkan Peninsula and Anatolia would have led to a considerable contrast in the gene pools of the two areas.) The results of this intrusion can be perceived in modern populations in terms of a few classical traits like hair and eye color, and some

measurements, but the contrasts are not great. Blood-type frequency distributions seem to offer a somewhat better record of this event.

The other aspect of mixing is the expansion of Caucasoid populations (whether European or Anatolian) over Mongoloid peoples in the northeastern part of Europe. The results of this mixture are much more evident in terms of visible anatomical traits, and can also be traced in the frequencies of blood types.

These two aspects overlapped in time, but they are discussed mostly in the order given above. The focus here is on the geographic and demographic factors that would have determined these mixtures, and not the results in terms of distribution of the characteristics themselves. Beyond a superficial check for consistency, I leave it to others to compare these results with detailed racial data.

Anatolian-European Mixture

Recently it has been suggested that agricultural practices spread into Europe by diffusion (imitation) as opposed to being carried in by a wave of immigrants (Dennel 1983). If true, this would be the only known instance of a hunting people who eagerly adopted the farming way of life. The documented history of hunter-farmer contacts around the world in recent centuries has always shown a great reluctance on the part of nomads to shift to a sedentary existence. In all known cases the spread of agriculture has been accomplished primarily by the spread of the actual farmers themselves (Smith 1976).

It does not follow from this that all, or even most, of Europe's present population is descended from the Near Eastern immigrant farmers. A native admixture of only 2% for each 40 km of frontier advance would cumulatively reduce the Anatolian gene



pool to only 20% of its original component at the far end of Europe. This decline would be gradual, but not linear. At each step the rate of retention of Anatolian genes would be .98, so one multiplies .98 times .98 times .98, and so on, for as many 40-km steps as are being measured. This leads to a rate of decline that is necessarily rapid at first, and becoming more gradual as it progresses.

At this rate the incoming genes would be reduced to half their frequency just to the west of Vienna, and their remainder halved again at the border of Scotland and by lands' end in most other directions. In all, the collective gene pool of Europe would end up about half native and half intruder, with a strong cline from the entry point to the far west and north. The known distribution of genetic traits in Europe conforms quite well to this description (Menozzi, Piazza, and Cavalli-Sforza 1978). There is no reasonable way to explain this genetic distribution without postulating just such an immigration, whether by farmers or by some others. And there is no known force, other than farming, that would accomplish this degree of population replacement in its initial advance.

A similar intrusion can be postulated for the first appearance of agriculture in northern India, and the distribution of genetic traits again conforms with this pattern. Agriculturalists also overran most of sub-Saharan Africa from a Negroid source just north of the Equator. In this case the percentage of native incorporation (of Pygmies, Bushmen, and Hottentots) was apparently much less, judging from their gene frequencies (Krantz 1980). Distributions of external traits also tend to follow the same trends in Europe, India, and southern Africa. Anatomical features characteristic of the source areas gradually decline in each subcontinent as one moves away from those sources.

One objection to the immigration scenario is that there was not a great population reservoir in western Anatolia at an early date to supply this influx (Dennel 1983). This objection apparently is based on an analogy with modern migrations, where

the migrants are drawn from a vast area by sophisticated means of mass transportation. By contrast, the earliest Neolithic expansion was strictly a frontier phenomenon. Each increment of population expansion that needs land to farm will simply move to the nearest suitable place that is known and accessible. At or near the frontier there are new lands available for occupation. A hundred km behind that frontier these new lands become inaccessible and probably unknown, so expansion moves into the less desirable local places immediately at hand. No great reservoir of population was needed for this kind of expansion--just an open frontier with some ordinary people who are overreproducing themselves.

In the following discussion I draw the line between the European and Anatolian (Asian) gene pools at the Dardanelles and along the Caucasus Mountain divide. A similar line between North Africa and Europe is put at Gibraltar. This may seem to be a rather arbitrary geographical boundary, but it is probably the best available for present purposes because these would be the original major barriers to gene flow.

The model of frontier expansion makes some reasonable, though undemonstrable, assumptions that have already been described. The farmers' initial occupation of some 500 sq km out of each block of 1600 should probably involve little or no mixing with the local inhabitants. It is their subsequent expansion into the other two-thirds of each block that leads to the absorption of some of the natives. As this would begin in earnest only after the initial colonizing activity had passed on by more than 40 km, the local foragers would find it increasingly difficult to survive or even to escape envelopment.

As the farmers eventually fill out a 40-km square to a density of one person per sq km they reach a population of about 1600. If they incorporate 2% of their own numbers in each such block, this means taking in 32 out of an original hunter population of 160. The other 128 hunters can be accounted for by a mixture of killing and dispersing some, and absorbing others without allowing them the opportunity to reproduce. Actually,

the hunter population in this square would have been reduced to more like 110 when the farmers took the best one-third of the area; the missing 50 could have moved elsewhere as stragglers. Then taking in 32 people out of a trapped 110 constitutes a 30% absorption rate of the natives. This of factor 30% is used throughout this reconstruction.

Where adverse climatic conditions significantly delay the frontier advance, this model should still hold for each 40-km geographical unit, on the average. The added time allows for more casual interbreeding between invaders and natives. Extra native genes would enter the farmers' gene pool. Extra farmer genes would also enter the natives' gene pool. These displaced farmer genes will be recovered as the frontier advances, thus negating the extra incorporation of native genes. Presumably, those natives who most resemble the farmers are those most likely to be added to the frontier population.

This incorporation model may be followed over most of Europe, from Greece all the way to Sweden, Ireland, and Spain. At a .98 retention rate for each 40-km movement, these results are mapped at 10% intervals in Fig. 14. This shows the percentage of western Anatolian genes that ought to have survived in each area. With a few changes discussed later, this should also be a close approximation of the present condition.

A major exception to the above model occurs in eastern Europe outside of the Balkans. Within this area it already has been proposed that a pastoralist economy had spread out from a source in the Hungarian Plain, and this was composed entirely of native Europeans. Their population would have been 0.25 per sq km, or two and a half times that of native foragers. Thus, when farmers overran this area (excluding the plain itself) they would outnumber these herdsmen by only four to one, instead of the usual ten to one as elsewhere.

The same model for farmers overrunning hunters is followed here, with just one basic change being required. In the original model 30% of the natives who were trapped behind the frontier were incorporated into the farming population. The same factor

of 30% can be used here, but now applied to a larger base number of natives. In a given 40-km square the herder population would ideally be 400, at .25 per sq km. Upon losing the prime one-third of the area to the farmers they are reduced to 275 people. When the farmers fill the rest of the square and absorb 30% of these, it means 82 people are taken in and the remainder are neutralized in other ways. These 82 people will then constitute 5% of the population of 1600 farmers. In other words, the genetic retention rate will shift from .98 down to .95 when farmers overrun each 40 km of herders.

In those parts of eastern Europe where Uralic pastoralists preceded the Indo-European farmers, a .95 retention rate for Anatolian genes has been used in the map (Fig. 14). In the Hungarian Plain itself the farmers were mostly excluded, but they heavily penetrated some parts of it, so the retention figure for European genes was arbitrarily put at 60 to 70%, thus matching the adjacent peoples. The population of the lower Danube is similarly assigned the same gene frequency as its neighboring farmers. Beyond Lithuania and Belorussia the advance of the Indo-Europeans was halted for a long time, so the farmers beyond here would be 100% European.

The Indo-European frontier also halted part way up the Scandinavian Peninsula at the 120-day growing-season line. Part of the Neolithic technology, primarily cattle pastoralism, would have been transferred to the native Nordics who were completely European in their genetic make-up.

Still one other halt in the Indo-European advance apparently occurred in the highlands of Scotland. Here farming is almost impossible, but sheep herding and fishing do well. The Sea Shepherds out of the Aegean are almost certainly the source of the pastoral population here.

Sea Shepherds would have been fully Anatolian in genetic make-up at their source point in Rhodes. There is no obvious logical structure to calculate their rate of incorporation of native peoples following the model of other population movements. The major difference is that these Boat People spread inland from

the coasts, generally only short distances at first, so native hunters would not tend to become trapped by an engulfing frontier of new peoples. Also, their postulated advance rate of 200 km per generation is the fastest of any in this reconstruction.

The normal rate of genetic retention for herders overrunning hunters is shown below to be .92 per generation, or .815 per 200-km advance. This low rate should not apply to the Sea Shepherds for the reasons noted in the last paragraph. The rate should be higher than the .92 per generation, and I have arbitrarily put it at .95 simply as an educated guess.

Allowing two units of mixing in crossing the Aegean, and 54 more 200-km units to reach Scotland, the Anatolian component would have been reduced to just 6%. Thus they were 94% European in their genetic make-up at the end. In contrast, the farmers who reached that point somewhat later in time were reduced in 70 steps of 40 km, but with only a 2% admixture in each, so they should have arrived in Scotland with 23.8% Anatolian genes.

If the native foragers had continued to survive in Scotland, a transfer of sheep to their care would leave the Highlands 100% European in genetics. But if the Boat People had prevailed and occupied the area, as is most probable, they might have been about 6% Anatolian. If they mixed significantly with natives the result would have been somewhere between zero and 6% European, but closer to the latter. In any case the cline of Anatolian genes would drop from 23.8% near the Scottish border, down to about one-fourth of that amount.

Caucasoid-Mongoloid Mixture

The spread of pastoral people to the north and east out of the Hungarian Plain, in a wave that was followed for a short distance by farmers, is the major one that had racial implications of the visible type. These herders were of pure Caucasoid



race (not to be confused with Caucasian languages) in terms of such classical traits as skin, hair, and eye color; hair form and distribution; and nose form and body type. In their advance to the north-east these herders encountered and overran hunters of the Mongoloid racial type (Fig. 15). The mostly invisible genetic contrasts between Europeans and Anatolians, as discussed above, are here combined into the commonly understood racial type of the West.

The Caucasoid-Mongoloid racial line used here is based on the most likely areas of development of their specialized traits during the last glacial epoch, and on their expectable northward expansions as the ice melted. I have allocated all of subglacial Europe to the Caucasoids, also the area around the Black Sea, the Caucasus Mountains, and Iran. Mongoloids are assumed to have lived east of the Caspian Sea and throughout central Asia; they were the more cold-adapted people.

With climatic amelioration both racial types would expand northward, but the Mongoloids had the distinct adaptational advantage and would have spread well to the west of their original area. The ultimate racial line can be drawn from the north shore of the Caspian Sea to Leningrad and extending it through Scandinavia, but leaving all of Finland on the Mongoloid side because of the early Baltic Sea barrier. This line in Scandinavia also fits well with the last melting away of the local ice sheet, where early hunters would meet after entering the peninsula from opposite ends at the same time. This dividing line might appear to be highly speculative, but any attempt to place it as much as 200 km in either direction would raise serious geographical problems, if not impossibilities. Obviously there would have been considerable racial mixture along this line, with a dilution of both types for some distance to either side. But for purposes of counting gene frequencies at greater distances, a sharp line or a mixed zone would both produce the same results.

The same general model for genetic mixture can be followed here, just as in the previous cases, where farmers were the

overrunning population. The herding intruders here move in 80-km squares, first occupying the prime area of a 50-km circle that is arbitrarily placed in its center. The 6400 sq km of the square originally should be inhabited by some 640 native hunters. A tribal unit of 500 herders then moves in to occupy the 2000 sq km of ideal territory, displacing 200 of the hunters and leaving 440 of them behind. The herders then expand into the entire square with a final population of 1600. If they also incorporate the usual 30% of the 440 remaining hunters, these constitute 132 of the new herder population. These 132 are now 8% of the 1600 herders in this 80-km square. This means a genetic retention rate of .92 for each step of 80 km, and is the equivalent of a rate of .96 for a 40-km farmer-sized move. For purposes of long-range mapping, the three cases may be compared.

<u>Replacement</u>	<u>Retention Rate</u>	<u>Per 100 km</u>	<u>Per 200 km</u>
Farmers over Hunters	.98 per 40 km	.951	.904
Farmers over Herders	.95 per 40 km	.876	.774
Herders over Hunters	.92 per 80 km	.900	.815

A new complication enters the picture when the pastoralists change their emphasis from cattle to reindeer at the line of pure coniferous forests (Figs. 12 and 15). This was postulated to have reduced their density of occupation, and increased the size of their tribal areas and made their rate of advance faster. It may be assumed that hunters in this environment were similarly reduced in density, so no correction need be made for this aspect. The only significant difference would be the increased distance these herders now advance in each generation. Previously this was expressed in the reduced basic time for them to advance each 200-km unit, from 75 down to 60 years, plus penalties.

In this context the movement of reindeer herders should first be thought of as an increase from 80 to 100 km for their advance per basic generation. With the same genetic retention rate per generation of .92, this is now their rate per 100 km.

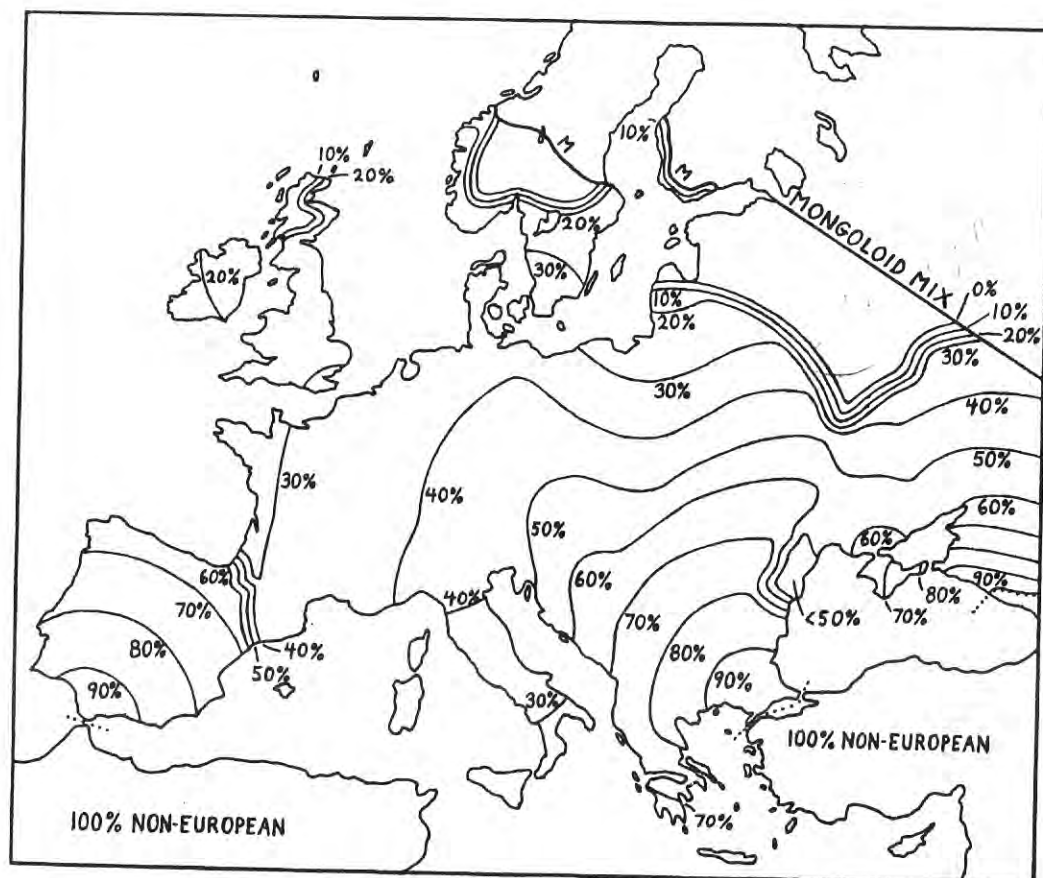


Fig. 14. Non-European genes. Approximate levels of Anatolian and African genetic contributions are shown at 10% intervals over the continent. Additional genes from the Aegean source are not figured in here--this should somewhat raise the Anatolian component along the Mediterranean coast. Large areas of pure European genetics may be noted in Scandinavia and Russia. These isogenes are cut-off at the heavy line marking Mongoloid mixture.

Their rate per 200-km unit is then the square of this, or a .8464 retention.

The reindeer boundary on the main Finnic path is crossed 200 km before they enter Mongoloid territory. On the Samoyed path it is crossed 200 km after passing this racial line. The Vogul/Ostiaks cross it 400 km into the Mongoloid area. The expected retentions of Caucasoid racial genes may now be mapped with careful attention paid to the rates according to which type of animal is presumed to be the major domesticate. The results of this are shown on the Eurasian map in Fig. 15.

The move of the Finnic branch through Finland and into the Scandinavian Peninsula enters Mongoloid territory already with the reindeer adaptation. They overrun and incorporate these natives with a retention rate for their Caucasoid traits of almost .85 per 200-km unit. Their component of Caucasoid genes begins with 100% at Leningrad, declines to 51% at the head of the Gulf of Bothnia, and reaches a low of 37% when they cross back over the racial border in mid-Scandinavia. After that point they are incorporating more Caucasoid genes from the early hunters who entered Scandinavia from the other direction. Their Caucasoid proportion then rises to about 53% when they finally meet the Indo-European farmers and Nordic herders.

Within the total area of greater Lappland, including two-thirds of modern Finland above the farming line, the overall average of Caucasoid genetic background works out to 50%. This would have been the condition as of 3130 B.C. when the herders met in Scandinavia and closed out the last of the pure hunters.

During the 5000 years since then, these Lapps have been in contact with northern Europeans in and around much of their territory, but with almost no contact with Mongoloid populations. The expectable gene exchange with their more numerous neighbors would have somewhat increased their proportion of Caucasoid genes. It is also likely that social selection, especially in more recent centuries, would have favored the European physical appearance beyond their total genetic composition, thus further increasing the Lapps' resemblance to their fully Caucasoid

neighbors.

The Samoyed path to the north-east passed over Mongoloid territory for 200 km with presumed cattle breeding. The retention rate of Caucasoid genes would be .815 for this segment. After this the reindeer herding rate of .8464 applies to the rest of their expansion. At this rate their Caucasoid component is reduced to 50% in 800 km, and halved again to 25% in just over

800 more km. At the eastern limit of Samoyed distribution in the Taymyr Peninsula it reaches a low of only 7%.

The recent Samoyed distribution runs from 1000 km beyond the old Mongoloid line all the way to the Taymyr Peninsula. The Caucasoid component for the area ranges from 42.5% down to 7.1% across this distance in the initial spread. This gives an average of just under one-fourth Caucasoid genes, and three-fourths Mongoloid. This conforms reasonably well with their observed physical traits. They would have reached their eastern limit at 880 B.C. according to the present schedule. The subsequent almost 3000 years of internal mixing should have evened out the east-to-west discrepancy to a considerable degree. Further selection for Arctic-adapted Mongoloid traits should also have occurred in place, thus increasing their Monogloid appearance.

The Vogul/Ostiak history is similar to that of the Samoyeds. The distance traveled and timing involved is close enough to theirs, so that similar Caucasoid-Mongoloid proportions should have been strung out over roughly the same west-to-east distribution. Both this group and the above Samoyeds are spread over such large areas that significant genetic contributions from outside were unlikely. Only with the recent Russian penetration and control of the entire region has there been much mixture, especially along the southern fringe.

The racial make-up of Europe presented here remained constant until the ethnic movements began in 500 B.C. The subsequent changes are mostly minor because population increase, in place, was the general rule. Some estimates of these later changes are summarized in the later chapter on the Final Adjustment, and are shown in Figs. 29 and 30.

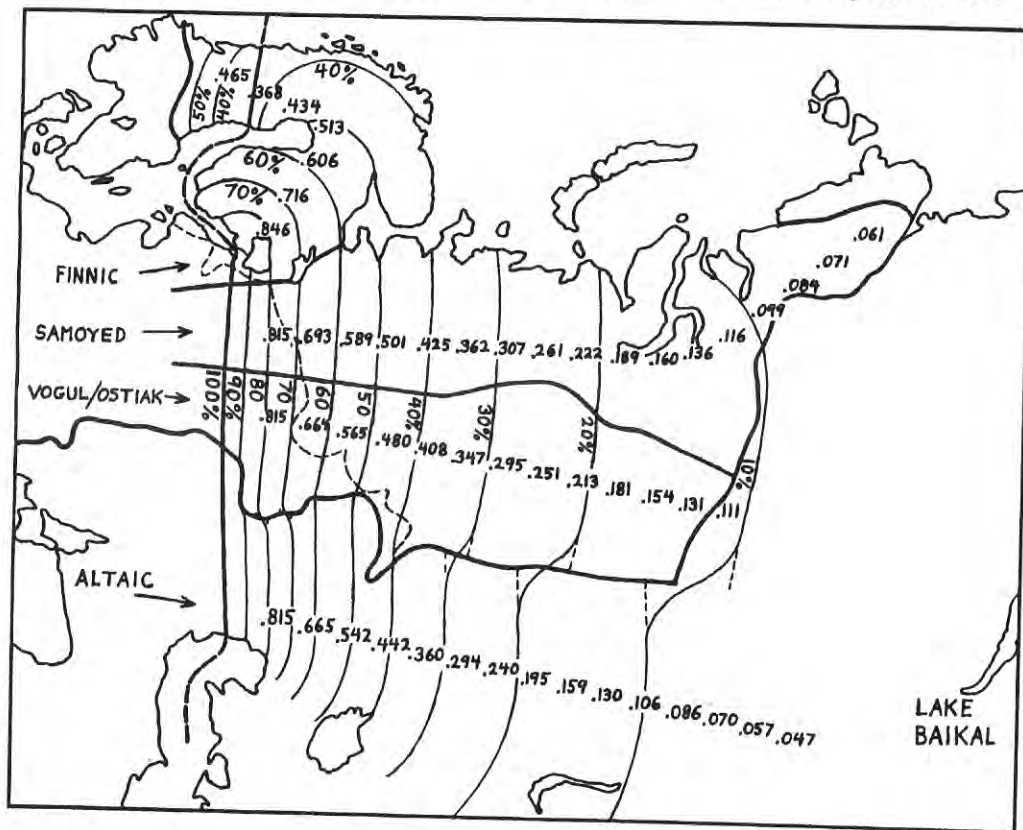


Fig. 15. Caucasoid genes in Asia. The nearly vertical, heavy line on the left shows the original Caucasoid-Mongoloid racial boundary. Economic movements to the north and east spread the Caucasoid component in these directions. Each 200-km figure is given; and fine lines mark the 10% intervals. A Mongoloid component was interjected into the Caucasoid side in central Scandinavia. A dashed line marks the reindeer boundary.